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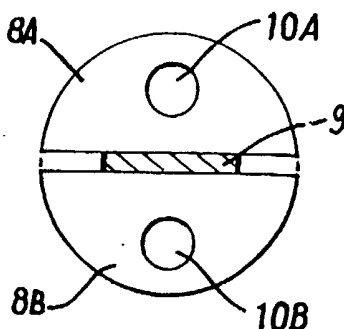
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(54) Title: PTC HEATING DEVICE



(57) Abstract

The invention provides a heating device for insertion into items to be gripped such as motor cycle handles or hand grips on invalid chairs. The heating device comprises a positive temperature coefficient material (9) sandwiched between two electrodes (8a and 8b) such that electrical energy passing therethrough is dissipated in the form of heat. The "sandwiched" arrangement is cylindrical in shape so as to be inserted into an item to be gripped. The invention overcomes the problem of existing wire wound devices which were prone to breaking or short circuiting.

# + DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

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PTC HEATING DEVICE

This invention relates to heating devices and more specifically, but not exclusively, it relates to electrical heating devices which may be gripped.

In the past electrical heating devices have consisted of a heating element or wire, through which an electrical current has passed. Such heating devices have been prone to damage with an overload of current. Sometimes the heating effect of the current has burnt out the heating device. Premature "burn out" in some cases was due to mechanical imperfections in the wire.

A problem with this type of heating device was the wire has been permanently wound around or embedded in an element. Once a wire has been wound around, or embedded in, such an element, and if there was burn out, the wire was difficult to remove either for replacement or repair.

According to a first aspect of the present invention there is provided a heating device which comprises an elongate metallic member; a positive temperature coefficient material and a contact in electrical connection with the metallic member.

Preferably two elongate metallic members are provided each having a separate electrical contact.

Preferably the positive temperature coefficient material acts as a heating element and is sandwiched between the two metallic members. The members may act as electrodes.

Preferably the electrical contacts comprise a rolled pin, which is inserted into a suitable recess in the electric contact.

The heating device may be shrouded in a special elastoma moulded compound which allows push fit electrical connectors to mate with the rolled pins at an end of the device.

In a preferred embodiment an electrical supply is connected to the contacts such that the electrical energy dissipates in the positive temperature coefficient material as heat.

Advantageously the sandwiched arrangement is elongate and the members have a convex surface and a planar surface, such that when they sandwich the positive temperature coefficient material the resultant cylindrical formed body may be inserted

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into a tubular support or cavity.

Preferably the positive temperature coefficient material is in the form of a slab. The material may be a ceramic or cermite material.

A preferred material of the slab is described in granted U.K. Patent 2064928B in the name of Eichenauer A.G. which is a German company based in Kandel.

According to a second aspect of the present invention there is provided a heater for insertion into an item to be gripped.

Preferably a tube supports the heating device. The tube may be inserted into a handle-bar grip of a cycle, motorcycle, or perambulator. Similarly it may be inserted into the grip of a trolley or carriage, such as a golf trolley. Electrical leads from the heating element may pass directly to a generator, such as the alternator of a motorcycle, or they may pass to a suitable battery unit which is capable of providing adequate current at sufficient voltage to promote heating.

An advantage with this arrangement is that it has about 5 times the heat output per unit area than

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conventional resistive wire heaters. Also because of the inherent properties of the PTC material, less current is required to drive the heater.

Other embodiments of the invention may permit the heating device to be inserted within the tubular grip of a fishing rod or even for the heating device to be inserted into small tubular handles which may then be carried in a cyclist's pocket.

Another advantage of the invention, is that no control mechanisms or feedback systems are required in order to regulate the temperature of the device between an upper and a lower limit. Such devices are often required in conventional heaters. The heating device of the present invention thereby overcomes existing problems associated with such equipment. Mechanisms such as bi-metallic strips, which may be used to cut off electrical current at a particular temperature, are thus no longer required. This is because of the inherent nature of the positive temperature coefficient material.

Embodiments of the present invention will now be described, by way of examples only, and with reference to the accompanying figures in which:-

Figure 1a shows an overall view of a heating

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device within a motorcycle handle-bar;

Figure 1b shows an overall view of the heating device within the handle of a golf trolley;

Figure 2 shows a view of the exterior of the heating device;

Figure 3 shows an end view of the heating device;

Figure 4 shows in elevation an example of a rolled pin electrical contact;

Figure 4a shows an alternative embodiment of an insert ;

Figure 5 shows a plan view of elongate support members sandwiching a positive temperature coefficient material;

Figure 6 shows an elevational view of figure 5;

Figure 7 is an elevational view showing hidden detail of the heating device;

Figure 8 shows a sectional view along the line A-A of Figure 7;

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Figure 9 shows a plan view of Figure 7; and

Figure 10 shows a sectional view through a Mounting bush.

Figures 1a, 2 and 3 show diagrammatically a motorcycle 1, having a handle-bar 2 and a handle-bar grip 3. The end of the tubular handle-bar 2 is open and an insert bush 4, for receiving a heating device 5, may be pushed into the handle-bar 2. The insert bush 4 has a lipped neck 6 at one end and a circular hole 7 cut in its base, at the other end. Electrical energy for heating is supplied from the alternator (not shown) of the motorcycle.

Figure 1b shows an alternative application for the heating device 5 within a handle 20 of a golf trolley 24. A battery (not shown) may be supported on the trolley 24 and this may be used to supply the current for the heater, instead of an alternator on the motorcycle.

Figure 4 shows a rolled pin 11 which is inserted into a recess 10 in a metallic member 8 as described below. The pin 11 grips the inner surface of the recess 10 due to friction. The pin 11 because it is essentially hollow, is gently pushed



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into the recess and then a sharp axial force is applied to it. The force acts to deform the pin 11, such that it swells and fills the hole. This ensures a tight fit and gives a sturdy connection onto which standard electrical connectors (not shown) may connect.

Referring to Figures 5 to 9 inclusive the heating device 5 comprises two hemi-cylindrical metallic members 8a and 8b. Sandwiched between the members 8a and 8b is a slab of positive temperature coefficient (PTC) material 9. Recess holes 10a and 10b have been drilled in the semi-cylindrical members 8a and 8b respectively. These recesses 10a and 10b are for receiving electrical contact pins 11a and 11b respectively. Wires 21 are connected to the contacts by way of conventional cold crimp techniques. The sandwiched arrangement is then inserted into a silicone sleeve 12. This is a tight fitting sleeve 12 and ensures good heat transfer properties.

Figure 10 shows an alternative embodiment of the bush 4 wherein the ends have been rolled into a lip instead of turned. This embodiment is slightly cheaper to fabricate than the previous embodiment and may be easily formed from an extrusion of aluminium tubing. Aluminium tubing is used because

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of its good heat transfer characteristics.

The heating device 5 works on the principle that an electrical current passes along the wires 21, from a source such as an alternator or battery pack. The batteries should be capable of supplying an adequate current of a sufficient voltage to enable the heater device 5 to work for several hours. The current passes through the aluminium member 8a, through the PTC material 9, where energy is dissipated because of the material's electrical resistance, and thence the current passes through the contact 8b. The extended surface area of the metallic members 8 ensure a good electrical contact between themselves and the PTC material 9. The contact is enhanced because the materials are urged together under force inside the silicone sleeve 12. Contact is improved as the members expand due to thermal expansion.

The silicone sleeve 12 and its elements is loaded into the aluminium push fit bush 4 of Fig. 2-4. This, in turn fits into the inside of the handle-bar 2. The aluminium bush 4 has a V-groove 40 cut into it axially along the whole of its length. The groove 40 enables the complete device 1, when connected to electrical leads, to be inserted into the handle-bar 2. The groove 40 not only permits insertion into the handle-bar 2, but also prevents

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rotation of the device 1 about its axis, when in the handle-bar 2. This is because the seam weld of the handle-bar acts as a key in the V shaped keyway of the groove 40.

The wires 21 pass through the frame 50 of the motorcycle 1 or golf trolley 2, and are therefore sealed from the environment and are unable to catch on moving parts. Alternatively wires 11 may be attached to the frame by using adhesive tape.

The insert bush 4 may have a suitably swaged region at its sealed end. Swaging may be achieved by spinning the bush 4 at high velocity and bringing a tool into contact with a region of the cylindrical surface. The heat generated by the friction is sufficient to cause the bush 4 to deform and a shallow indented swaged end to form. This swaged region acts to grip the heater when inserted, thus preventing it from falling out in use.

It will be appreciated that variation may be made without departing from the scope of the invention to the extent that the heater may be inserted into various forms of grip or handle-bar arrangements or it may be used as a form of hand heating for example for outdoor leisure activities in cold environments. These may include insertion into

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fishing rod handles or handles of ski sticks or similar such items which must be gripped in cold temperatures.

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CLAIMS

1. A heating device comprising an elongate metallic member; a positive temperature coefficient material and a contact in electrical connection with the metallic member.
2. A heating device according to claim 1, wherein two elongate metallic members are provided each having a separate electrical contact.
3. A heating device according to claim 2, wherein the positive temperature coefficient material acts as a heating element and is sandwiched between the two metallic members.
4. A heating device according to claim 3, wherein the metallic members act as electrodes.
5. A heating device according to claim 3 or claim 4, wherein the electrical contacts comprise a rolled pin, which is inserted into a suitable recess in the electrical contacts.
6. A heating device wherein the device is shrouded in an elastomer compound, thereby allowing an electrical connector to mate with the rolled pin at an end of the device.
7. A heating device according to any preceding claim wherein an electrical supply is connected to the electrical contacts such that energy dissipates in the positive temperature coefficient material as heat.

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8. A heating device according to any preceding claim, wherein the positive temperature coefficient material is sandwiched between two hemi-cylindrical metallic members.

9. A heating device according to claim 8, wherein the positive temperature coefficient material is in the form of a slab.

10. A heater for insertion into an item to be gripped comprises an elongate metallic member; a positive temperature coefficient material and a contact in electrical connection with the metallic member so as to permit the flow of electricity therethrough such that substantially all the energy dissipated within the device is dissipated in the form of heat.

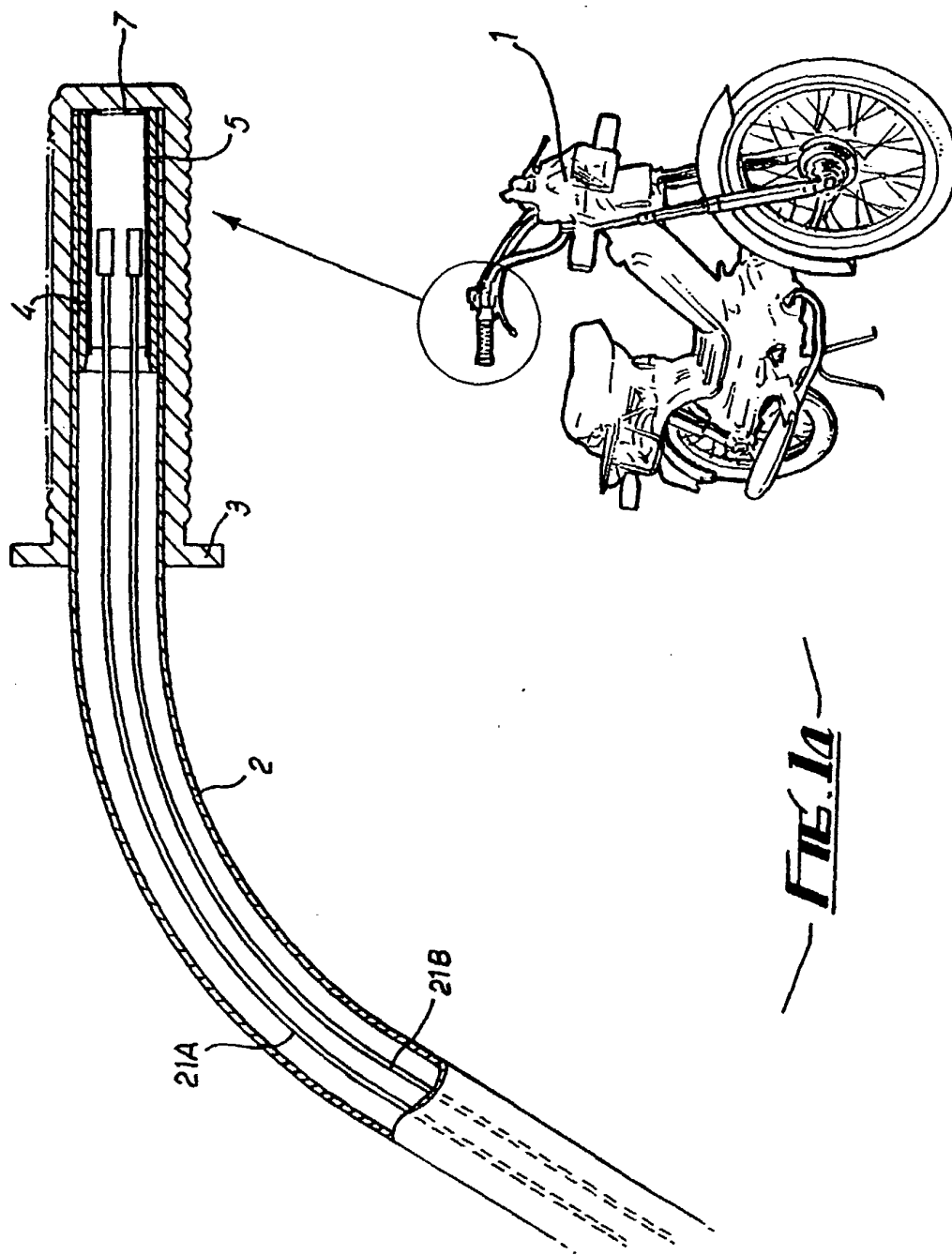


FIG. 1a

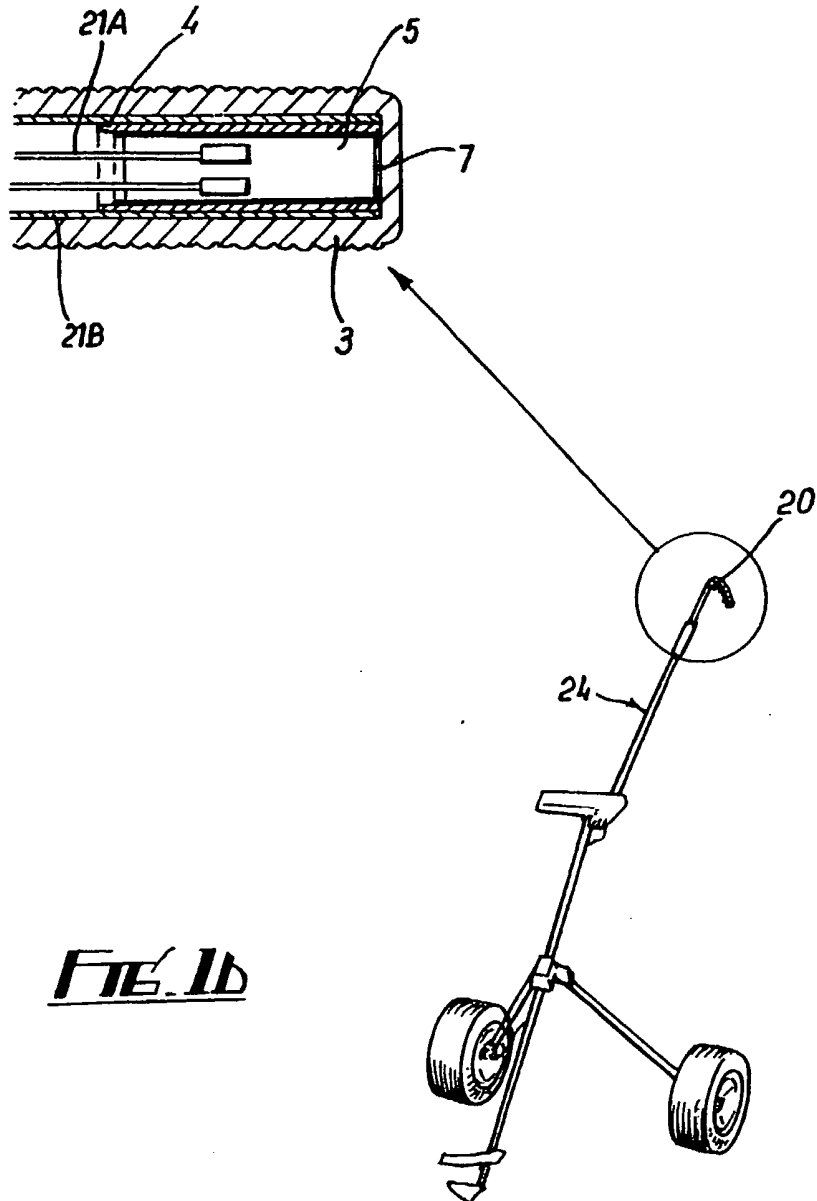


FIG. 1b



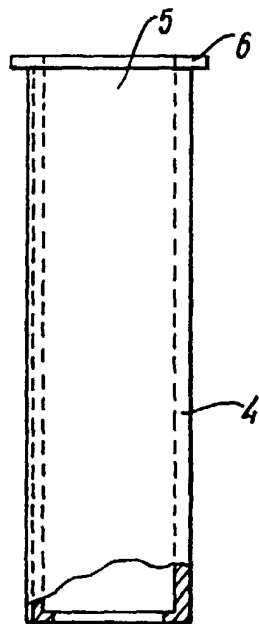


FIG. 2

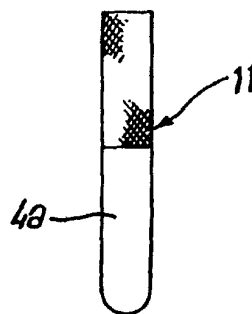


FIG. 4

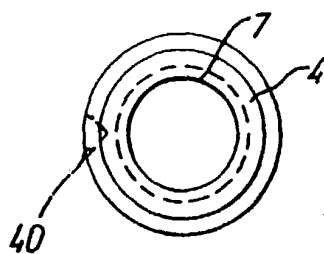


FIG. 3

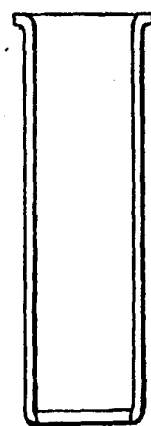
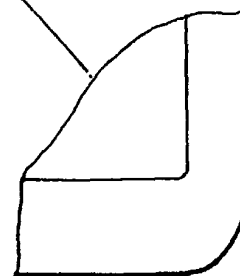
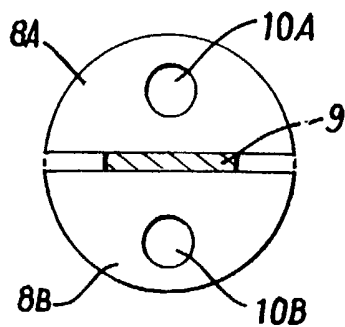


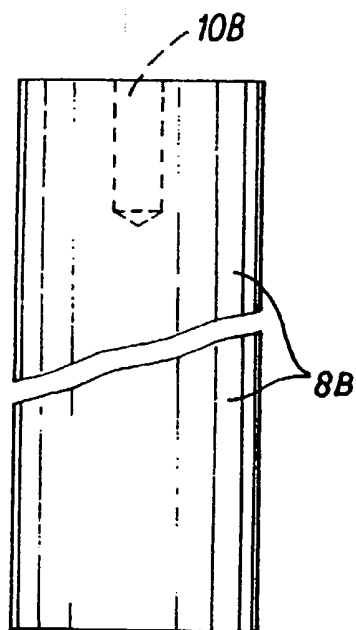
FIG. 4a



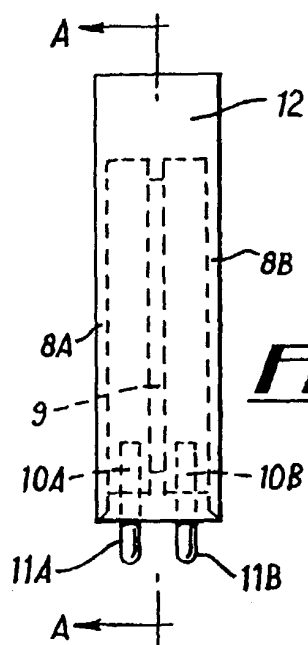
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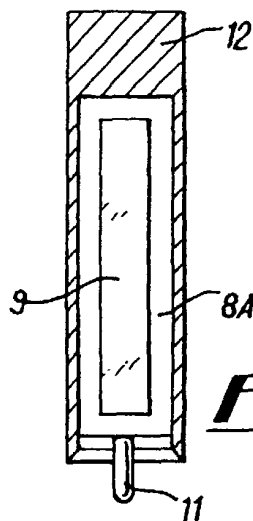
**FIG. 5**



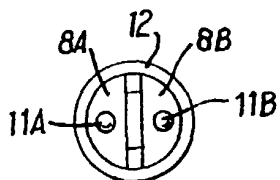
**FIG. 6**



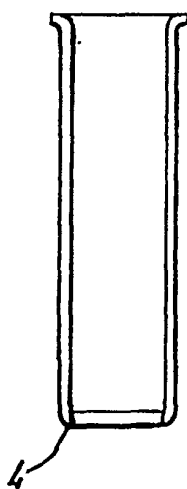
**FIG. 7**



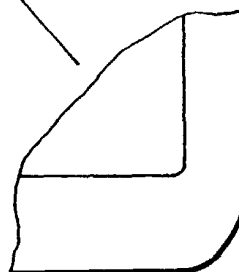
**FIG. 8**



**FIG. 9**



**FIG. 10**



## INTERNATIONAL SEARCH REPORT

PCT/GB 91/02054

International Application No

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 H05B3/14		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification Systems	Classification Symbols	
Int.Cl. 5	H05B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claims No. <sup>13</sup>
X	DE,A,3 545 414 (MURATA MANUFACTURING CO.) 3 July 1986	1-5,7-10
Y	*whole document*	6
Y	US,A,4 855 575 (MELANSON) 8 August 1989 *abstract* see figures 1-4	6
X	DE,A,3 636 571 (TURK & HILLINGER) 21 January 1988 *abstract* see figures 2,3	1-5,7-10
X	DE,A,3 616 460 (BRAUN AG) 19 November 1987 *abstract* see figure 6	1-4,7-10
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<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
21 FEBRUARY 1992	20.03.92	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	Gagliardi <i>[Signature]</i>	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT**  
**ON INTERNATIONAL PATENT APPLICATION NO. GB 9102054**  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-A-3545414	03-07-86	JP-A- 61158684	18-07-86
		GB-A, B 2183129	28-05-87
		US-A- 4831241	16-05-89
US-A-4855575	08-08-89	None	
DE-A-3636571	21-01-88	None	
DE-A-3616460	19-11-87	None	